ANNUAL REPORT 1964

STREETSVILLE

water pollution control plant

DIVISION OF PLANT OPERATIONS
Ontario Water Resources Commission

ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Streetsville Local Advisory Committee,
Town of Streetsville.

Gentlemen:

We are pleased to provide you with the 1964 Operating Report for the Streetsville Water Pollution Control Plant, OWRC Project No. 57-S-5.

By continuing the mutual cooperation which has existed in the past, we can look forward to greater progress in the field of water pollution control.

Yours very truly,

D. S. Caverly,
General Manager

General Manager,
Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Streetsville Water Pollution Control Plant, OWRC Project No. 57-S-5 for 1964.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report describes the operation of this project for the year 1964. It includes a detailed description of the project, summary of operation, graphs and charts showing quality and quantity information, and project cost data.

This information will be of value to the municipality in assessing the adequacy of the works in meeting existing requirements and in projecting its capability to meet future expected demands. The cost information will be of particular interest to those concerned with developing and maintaining revenue structures.

The preparation of this report has been a cooperative effort of several groups within the Division of Plant Operations. These include the Statistical Section, Brochures Officer and the Regional Supervisor. However, the primary responsibility for the content has been with the Regional Operations Engineer. He will be pleased to discuss all aspects of this report with the municipality.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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STREETSVILLE
water pollution control plant

operated for

THE TOWN OF STREETSVILLE

by the

ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN: Dr. James A. Vance

VICE-CHAIRMAN: J. H. H. Root, M.P.P.

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W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: A. C. Beattie
Operations Engineer: A. Clark

801 Bay Street — Toronto 5

'64 REVIEW

This report gives in detail the significant data on the operation of the various treatment units at the Streetsville Water Pollution Control Plant.

With an average flow of 0.47 mgd in 1964, the flow was still below the design capacity of 0.8 mgd. The average daily flows have increased gradually since 1961 and if the present trend continues the plant should reach hydraulic capacity before 1970. Although there was very little change in cost of operation from 1963 to 1964 the cost per million gallons treated was reduced from $102.00 to $81.39.

Under constant supervision by head office engineers, the plant staff has operated and maintained a clean, attractive plant for the Town of Streetsville.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY
1956 - 1964

In 1956 the Village of Streetsville and the Ontario Water Resources Commission initiated plans for the construction of a modern water pollution control plant. The firm of Proctor and Redfern Limited of Toronto, Ontario, was engaged to prepare plans and specifications for the project.

APPROVAL

On December 6th, 1957, the municipality signed an agreement with the Ontario Water Resources Commission to finance, construct and operate a water pollution control plant.

CONSTRUCTION

Tret Construction Company was awarded the contract and the project was started November 12th, 1957 and completed November 13th, 1958. The official opening was held on June 27th, 1959.

TOTAL COST

The total cost of the project was $310,937.98.

R. DADD
CHIEF OPERATOR

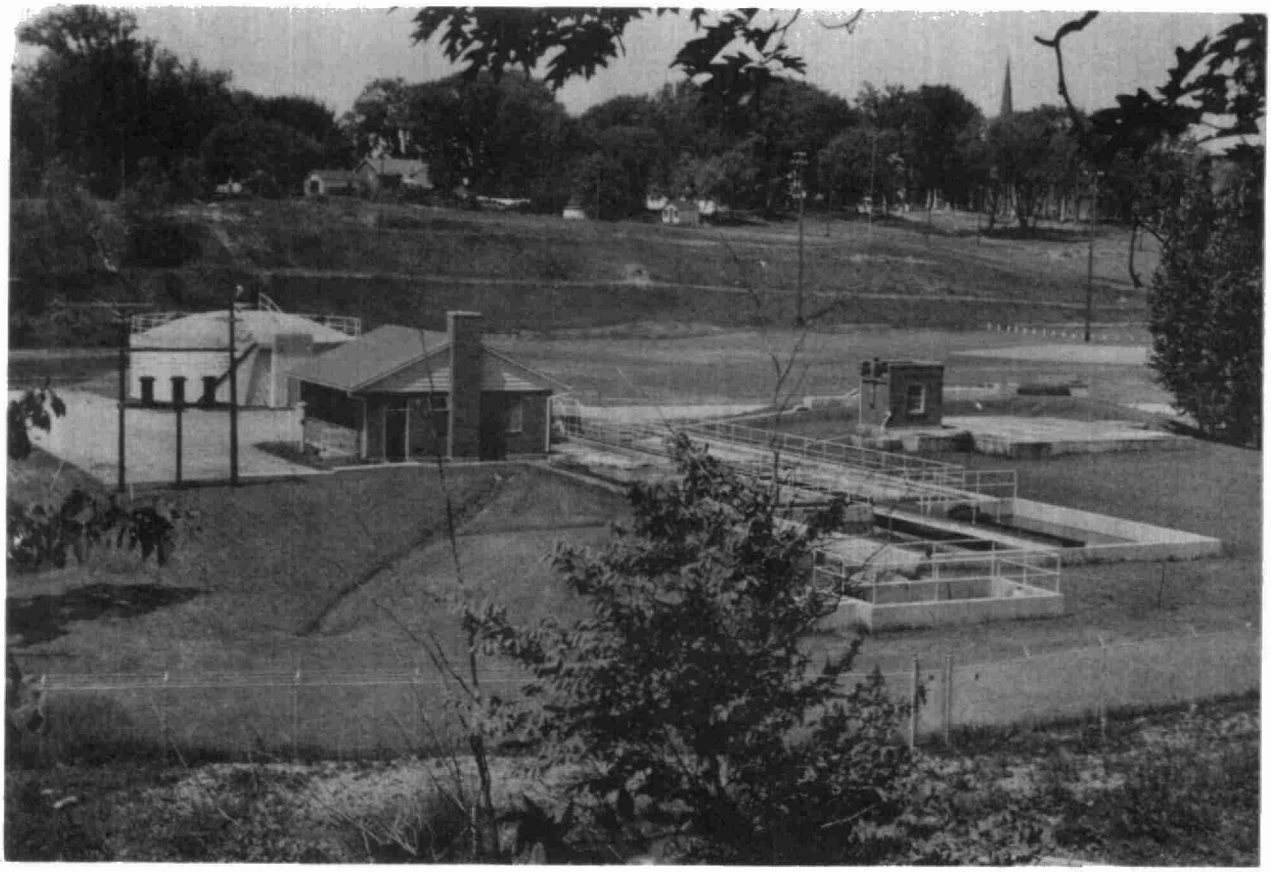
Project Staff

COMMENTS

The Chief Operator of the plant is Richard Dadd. Mr. Dadd has been in charge of the plant since 1959.

He is assisted by a casual labourer, R. Jess.

The plant has been operated to the satisfaction of the Division of Plant Operations.



Description of Project

SEWAGE COLLECTION SYSTEM

The sewage is collected by a system of separate sanitary sewers, including four pumping stations, and enters the treatment plant by gravity through two 12-inch and one 8-inch diameter cast iron inverted siphons.

These inverted siphons discharge to a common manhole at the north side of the plant site which is connected to the influent works by a 14-inch diameter cast iron pipe.

INFLUENT WORKS

The flow entering the influent works may be split, allowing excess flow to be diverted to the old settling tank. From this tank it flows to the chlorine contact chamber where it is chlorinated and then discharged to the Credit River.

For normal flows, however, the sewage passes through one of two manually cleaned bar screens where twigs and rags are removed, then through one of the two manually cleaned grit channels. Both of these channels terminate with a proportional weir which maintains a constant velocity through the grit channels of one foot per second. These channels have been designed to operate one at a time so that the other can be cleaned in readiness for operation.

From the grit channels the sewage passes through a Parshall flume, allowing the sewage entering the plant to be measured.

From the flume, the sewage enters the last chamber of the influent works, into which the 6 inch supernatant line from the digester discharges. The combined raw sewage and supernatant then flows through a 12 inch diameter cast iron pipe

to the influent well of the primary sedimentation tank. This 12-inch C. I. feed line is valved so that the sewage can either pass to the primary tank, by-pass the primary tank going direct to the aeration tanks, or by-pass the plant completely and flow to the chlorination chamber.

PRIMARY SEDIMENTATION

There is one primary sedimentation tank 35 ft. square which retains the sewage for 2.3 hours at design flow. This detention period is sufficient to allow approximately 50% of the suspended solids to settle out to the bottom. There is also a skimming mechanism which conveys surface scum and grease to a scum pit where, together with the sludge settled out in the bottom of the tank, it is pumped to the digester.

AERATION

Settled sewage from the primary tank flows to the aeration section where it is mixed with the activated sludge returned from the final sedimentation tank.

The aeration tank retains the sewage for a period of 6 hours at design flow plus 25% return sludge. This allows the biological environment sufficient time to remove the finely divided, suspended and dissolved organic material remaining in the flow.

The settled sludge (activated sludge) from the final sedimentation tank is recirculated back to the aeration tanks and mixes with the incoming effluent from the primary sedimentation tank.

This mixed lqiuor is then aerated by air supplied from compressors. The air supplied provides the oxygen requirements of the biological communities of aerobic micro-organisms (mixed liquor sludge floc) and also produces a roll which prevents settling in the tanks. The activated sludge which is returned acts as the vehicle for the bacteria which in turn oxidizes the organic material contained in the sewage.

FINAL SEDIMENTATION

The final sedimentation tank provides a detention period of 2.4 hours which is sufficient to allow the activated sludge to settle out. The activated sludge which is settled out in the final tank is returned to the aeration tanks and provides a continuous environment for the maintenance of floc in the tank. Excess sludge is wasted, being pumped to the digester.

After final settling, the effluent overflows the weir to a chlorine contact chamber where it is chlorinated and then discharged to the Credit River.

DIGESTION

There is a single digester at the Streetsville plant. Sludge from the primary tank is pumped, with excess activated sludge to this tank where, in the absence of air and in a regulated temperature of 90°F., the decomposing or digestion process begins.

The raw sludge when broken down by anaerobic bacterial action and thoroughly digested is a thick dark liquid.

The digested sludge is then disposed of by placing it on the sand drying beds or by truck haulage.

Sludge gas formed during the process is used as fuel for the heat exchanger supplying heat to the digester.

CHLORINATION

The effluent, prior to discharge to the Credit River is chlorinated and retained in a chlorine contact chamber for approximately 20 minutes. Facilities are adequate to supply chlorine at a rate of 200 pounds per 24 hours.

EFFLUENT FILTER

During periods of poor quality final effluent, part of the final effluent can be discharged to a sand filter bed which "polishes" the effluent prior to discharge to the Credit River.

PROJECT COSTS

LONG TERM DEBT: (Total Capital Cost)	$280,938.00

The total cost to the municipality during 1964 was as follows:

Net Operating	$ 14,024.94
Debt Retirement	5,669.00
Reserve	2,495.00
Interest Charged	15,805.65
TOTAL	$ 37,994.59

RESERVE ACCOUNT

Balance at January 1, 1964	$ 14,114.91
Deposited by municipality	2,495.00
Interest Earned	832.03
	$ 17,441.94
Less Expenditures	-
Balance at December 1, 1964	$ 17,441.94

DEBT OUTSTANDING:	$241,367.31

MONTHLY COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	* SUNDRY	WATER
JAN	722.94	305.76	136.00		123.43		27.46			119.63	10.66
FEB	1043.76	305.76	131.44	266.47	128.01	70.64	3.80		66.85	60.13	10.66
MARCH	695.31	305.76	126.04	26.10	118.03		61.92		21.81	30.75	4.90
APRIL	791.02	305.76	153.32	82.08	122.59	45.16	62.13			11.48	8.50
MAY	1078.02	458.64	322.92	16.94	124.11		6.15		126.56	15.28	7.42
JUNE	975.15	383.52	231.20	38.34	121.91		61.92		107.84	11.48	18.94
JULY	1951.26	305.76	577.13	40.98	126.89	710.99	17.29	17.75	29.52	110.73	14.22
AUG	1425.27	305.76	278.14	72.24	123.51		109.67		25.95	453.48	56.52
SEPT	892.35	322.86	227.00	40.50	121.72	(280.00)			60.41	378.22	21.64
OCT	1652.42	311.16	210.96	63.90	118.87	269.06	48.02	62.88	84.46	460.57	22.54
NOV	743.12	337.26	221.28		125.63		6.10		16.05	8.63	28.17
DEC	2054.32	462.24	210.30	140.28	121.07	(374.84)	82.90		397.56	991.37	23.44
TOTAL	14024.94	4110.24	2825.73	787.83	1475.77	441.01	487.36	80.63	937.01	2651.75	227.61

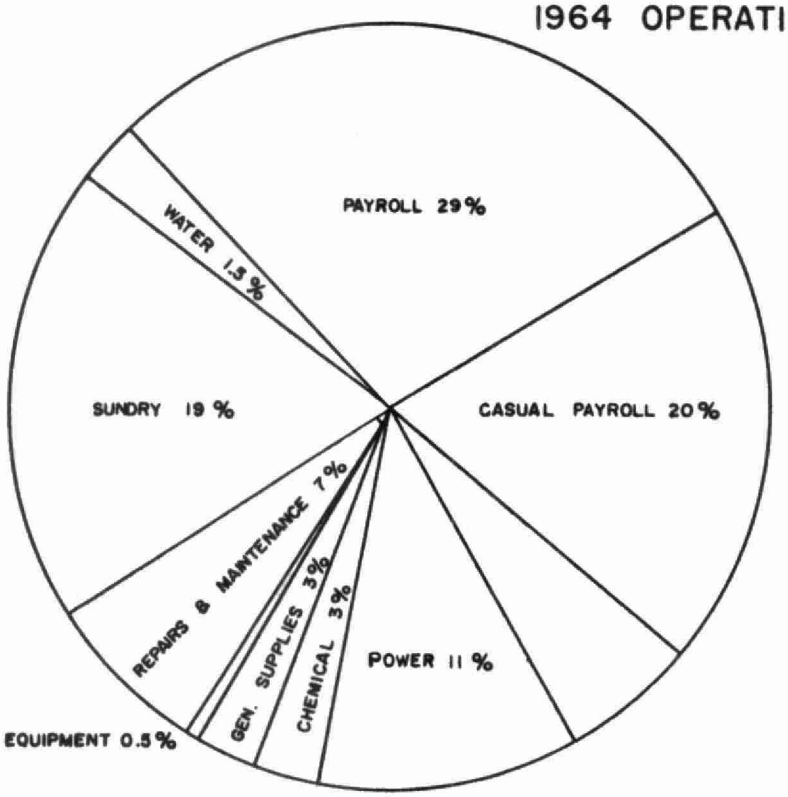
* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE $2331.25
BRACKETS INDICATE CREDIT

YEARLY COSTS

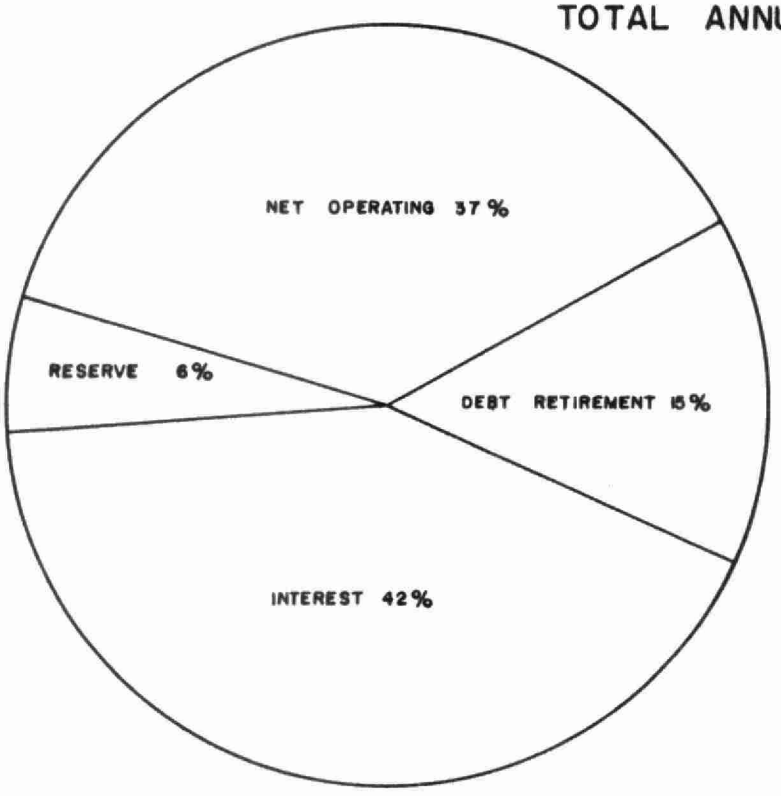
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1962	148.7	11416.75	* 8.58	77.30	2 CENTS
1963	140.6	14297.80	10.45	102.00	2 CENTS
1964	172.3	14024.94	9.59	81.39	3 CENTS

* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

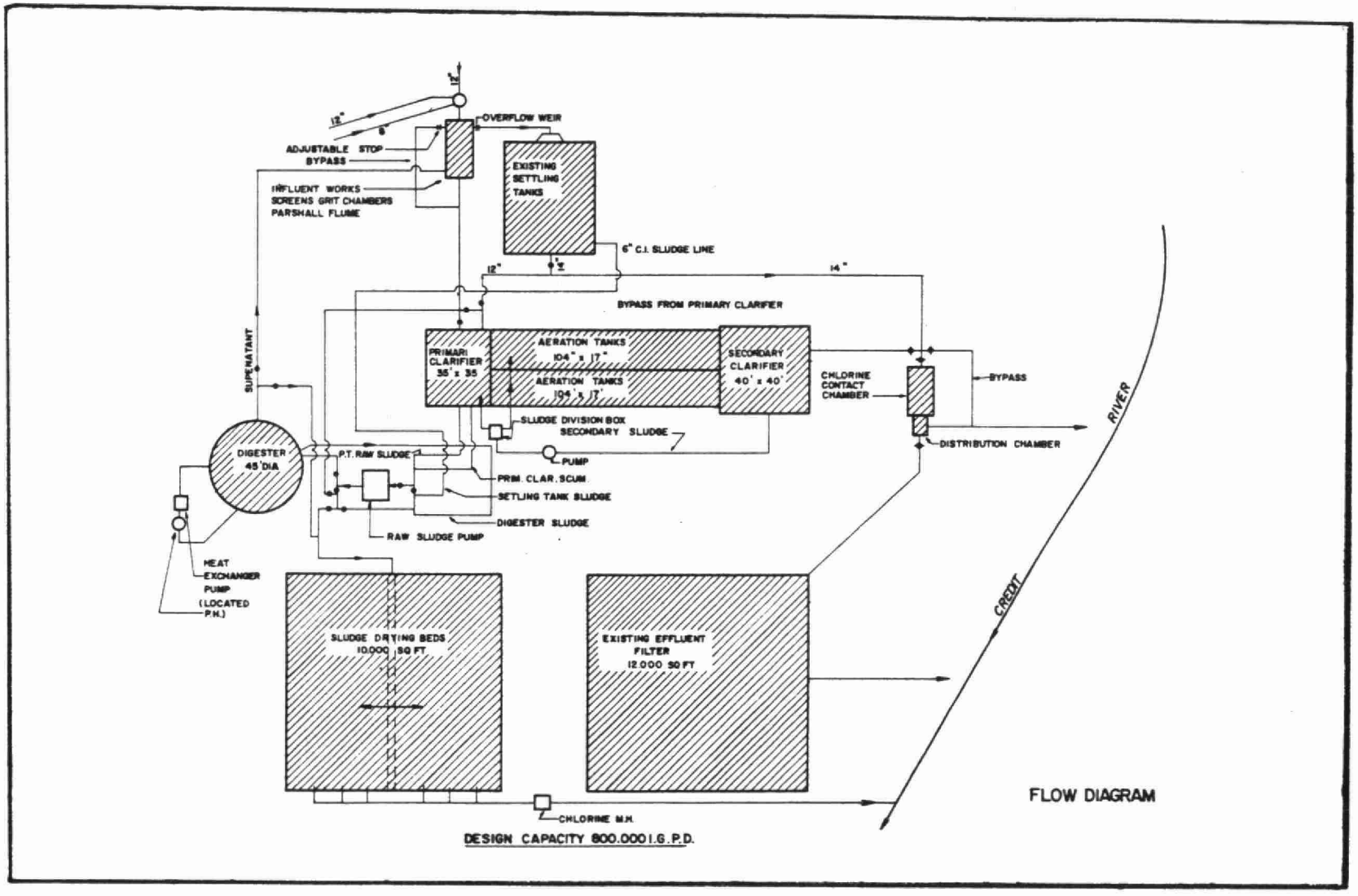
1964 OPERATING COSTS



TOTAL ANNUAL COST



Technical Section


OVERFLOW WEIR
ADJUSTABLE STOP
BYPASS
INFLUENT WORKS
SCREENS GRIT CHAMBERS
PARSHALL FLUME
EXISTING
SETTLING
TANKS
6" C.I. SLUDGE LINE
BYPASS FROM PRIMARY CLARIFIER
SUPERNATANT
PRIMARI
CLARIFIER
35' x 35'
AERATION TANKS
104' x 17'
AERATION TANKS
104' x 17'
SECONDARY
CLARIFIER
40' x 40'
CHLORINE
CONTACT
CHAMBER
BYPASS
SLUDGE DIVISION BOX
SECONDARY SLUDGE
PUMP
DIGESTER
45' DIA
P.T. RAW SLUDGE
PRIM. CLAR. SCUM
SETTLING TANK SLUDGE
DIGESTER SLUDGE
RAW SLUDGE PUMP
DISTRIBUTION CHAMBER
RIVER
CREDIT
HEAT
EXCHANGER
PUMP
(LOCATED
P.H.)
SLUDGE DRYING BEDS
10,000 SQ FT
EXISTING EFFLUENT
FILTER
12,000 SQ FT
CHLORINE M.H.
FLOW DIAGRAM
DESIGN CAPACITY 800,000 I.G.P.D.

Design–Data

GENERAL

Type of Plant - Activated Sludge.

Design Population - 8,000 persons.

Design Plant Flow - 800,000 gallons per day.

Per Capita Flow - 100 gallons.

Five Day BOD -

Raw Sewage - 240 PPM

Removal - 90-95%

Suspended Solids -

Raw Sewage - 260 PPM

Removal - 90%

PRIMARY TREATMENT

Influent Sewers

Two 12 inch and one 8 inch sewer connected to the influent works by a 12 inch diameter cast iron pipe.

Screening

Two manually cleaned bar screens.

Grit Removal

Two grit removal channels, detention provided 0.43 minutes at design flow.

PRIMARY SEDIMENTATION TANK

One Dorr-Oliver-Long - 35 ft. square by 10 ft. deep.

Detention Time - 2.3 hours.

Surface Settling Rate - 650 gallons per square ft. of tank per day.

Overflow Rate - 6250 gallons per lineal ft. of weir per day.

SECONDARY TREATMENT

Aeration Tanks

Two single pass tanks each 104 ft. by 17 ft. by 12 ft.

Detention Time - 6.1 hours at design flow plus 25% return sludge.

Air Supply to Tanks - Each tank has 24 separately valved banks of general filtration and engineering's Flo Rite air diffuser assemblies (total 96).

Air Blowers - Two rotary positive blowers rated at 760 cfm each. Air supply 1.2 cubic ft. per gallon at design flow.

FINAL SEDIMENTATION

One Dorr-Oliver-Long - 40 ft. square.

Detention Time - 2.4 hours.

Surface Settling Rate - 625 gallons per square ft. of tank per day.

Overflow Rate - 5400 gallons per lineal ft. of weir per day.

DIGESTER

One Tank - 45 ft. diameter by 26 1/2 ft. liquid depth.

Capacity - 4.5 cubic ft. per capita.

Loading - 1.5 pounds solids per cubic ft. tank per month.

SLUDGE BEDS

Two beds 50 ft. by 100 ft.

Total area - 10,000 square ft.

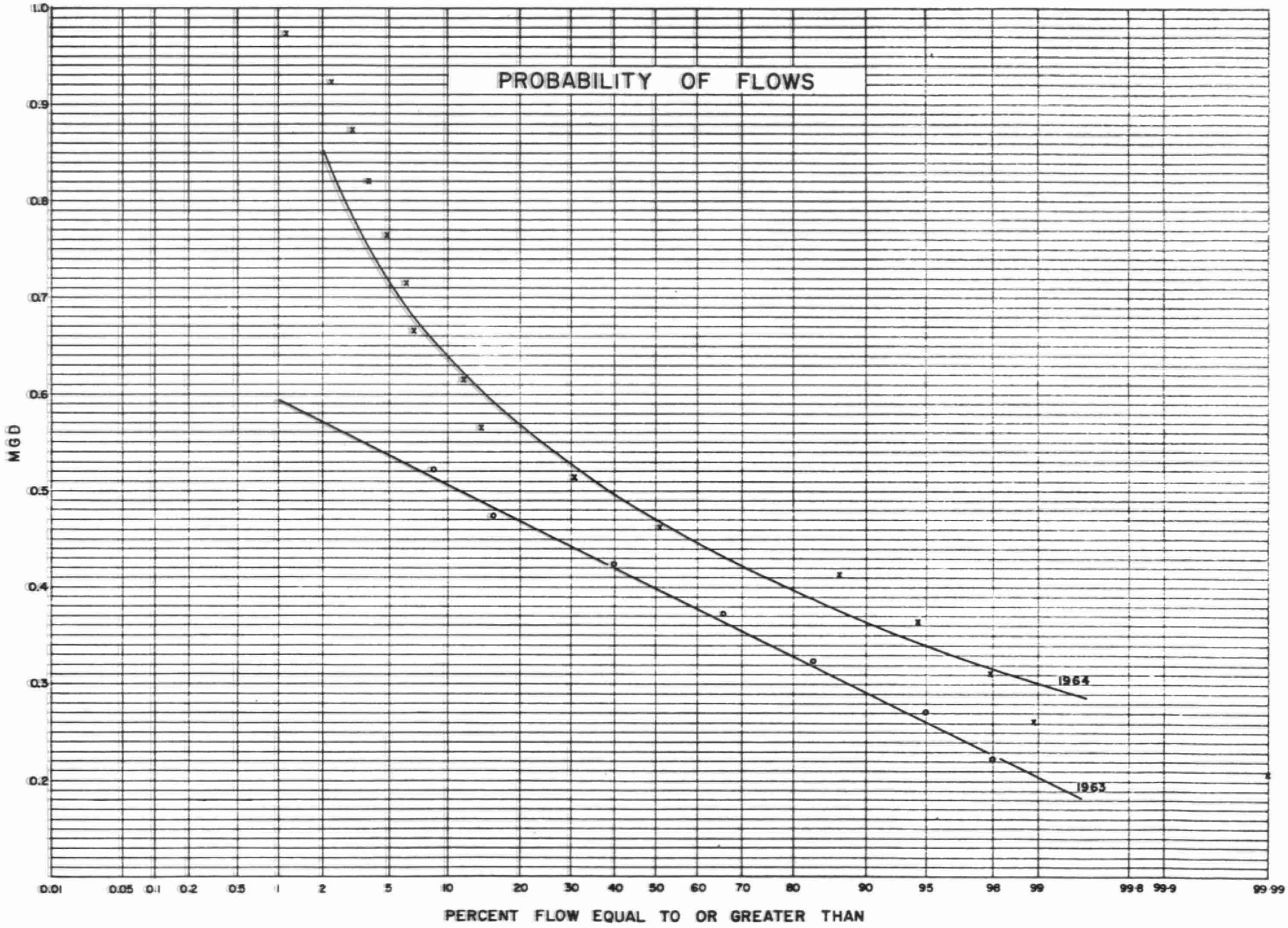
CHLORINATION

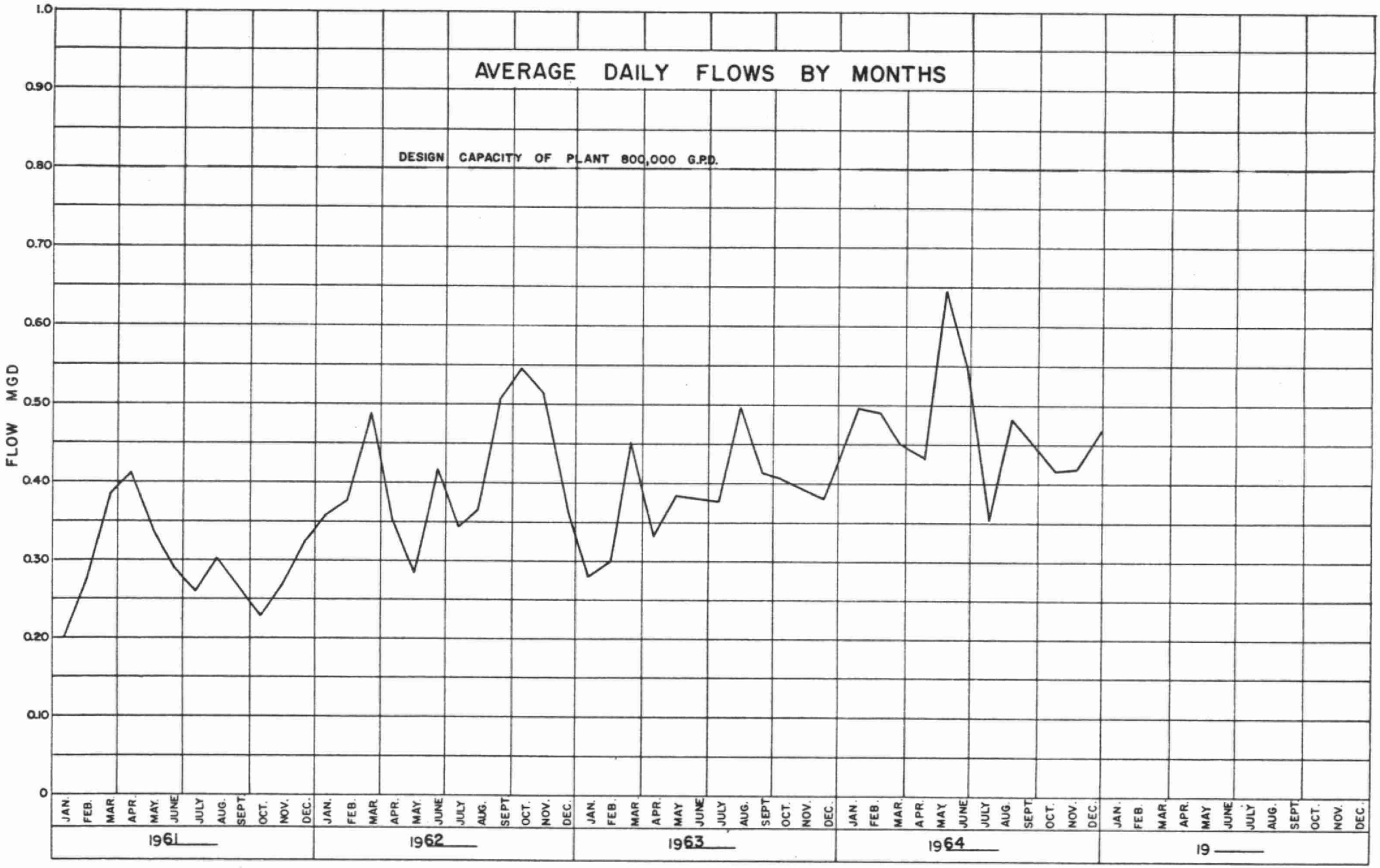
Contact chamber providing 20 minutes detention.

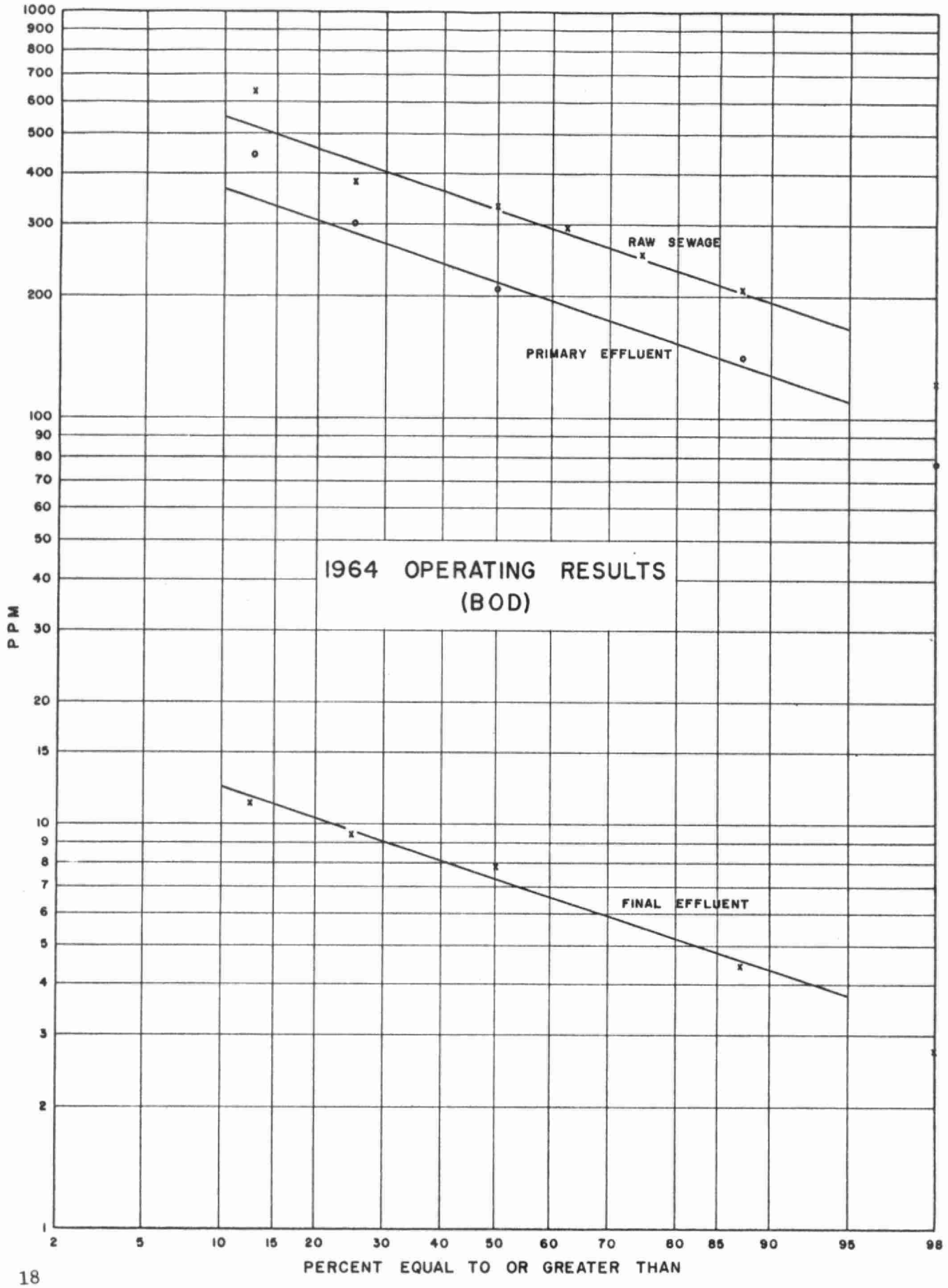
Capacity 200 pounds chlorine per 24 hours.

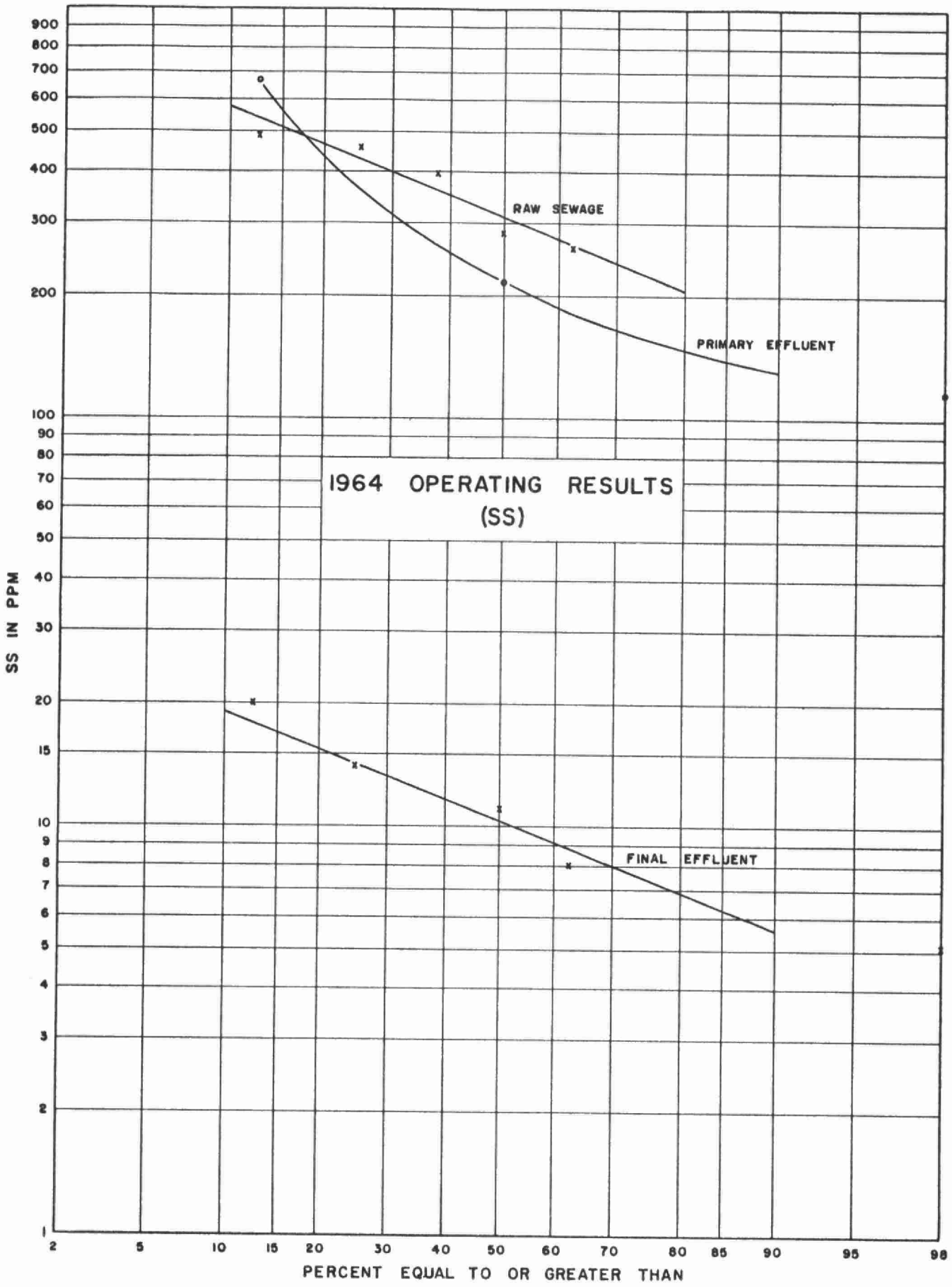
Process Data

During 1964, a total of 172.3 million gallons of raw sewage was treated at the Streetsville plant. This is an increase of 22% on that treated in 1963 and represents an average daily flow of 0.47 million gallons or 58% of the hydraulic capacity of the plant. The maximum twenty-four hour flow treated in 1964 occurred during the week of April 5 - 11 when a flow of 1.20 million gallons was recorded.


PROBABILITY OF FLOWS
MGD
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
1964
1963
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
PERCENT FLOW EQUAL TO OR GREATER THAN


AVERAGE DAILY FLOWS BY MONTHS
DESIGN CAPACITY OF PLANT 800,000 G.P.D.
FLOW MGD
1.0
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0
JAN. FEB. MAR APR. MAY JUNE JULY AUG. SEPT OCT. NOV. DEC.
1961
1962
1963
1964
19


1964 OPERATING RESULTS
(BOD)
RAW SEWAGE
PRIMARY EFFLUENT
FINAL EFFLUENT
PPM
1000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
PERCENT EQUAL TO OR GREATER THAN


1964 OPERATING RESULTS
(SS)
RAW SEWAGE
PRIMARY EFFLUENT
FINAL EFFLUENT
SS IN PPM
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
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10
15
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40
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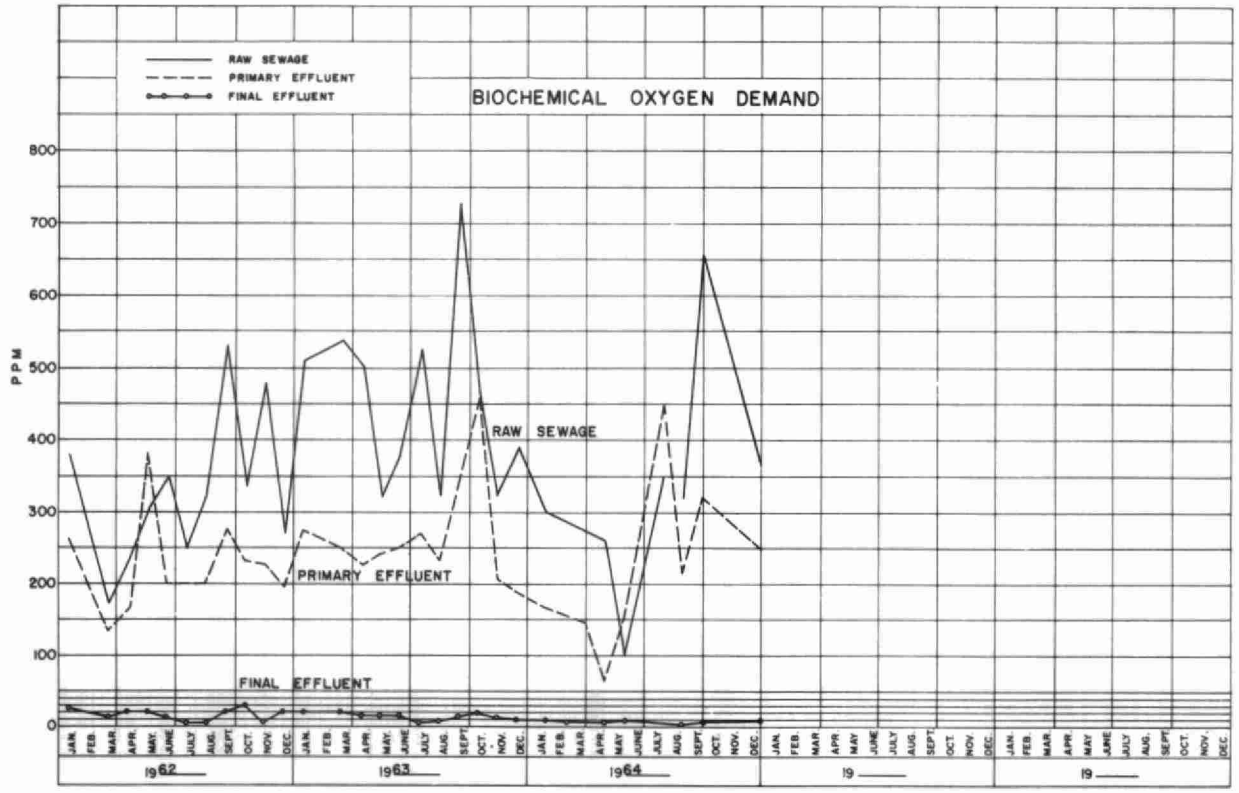
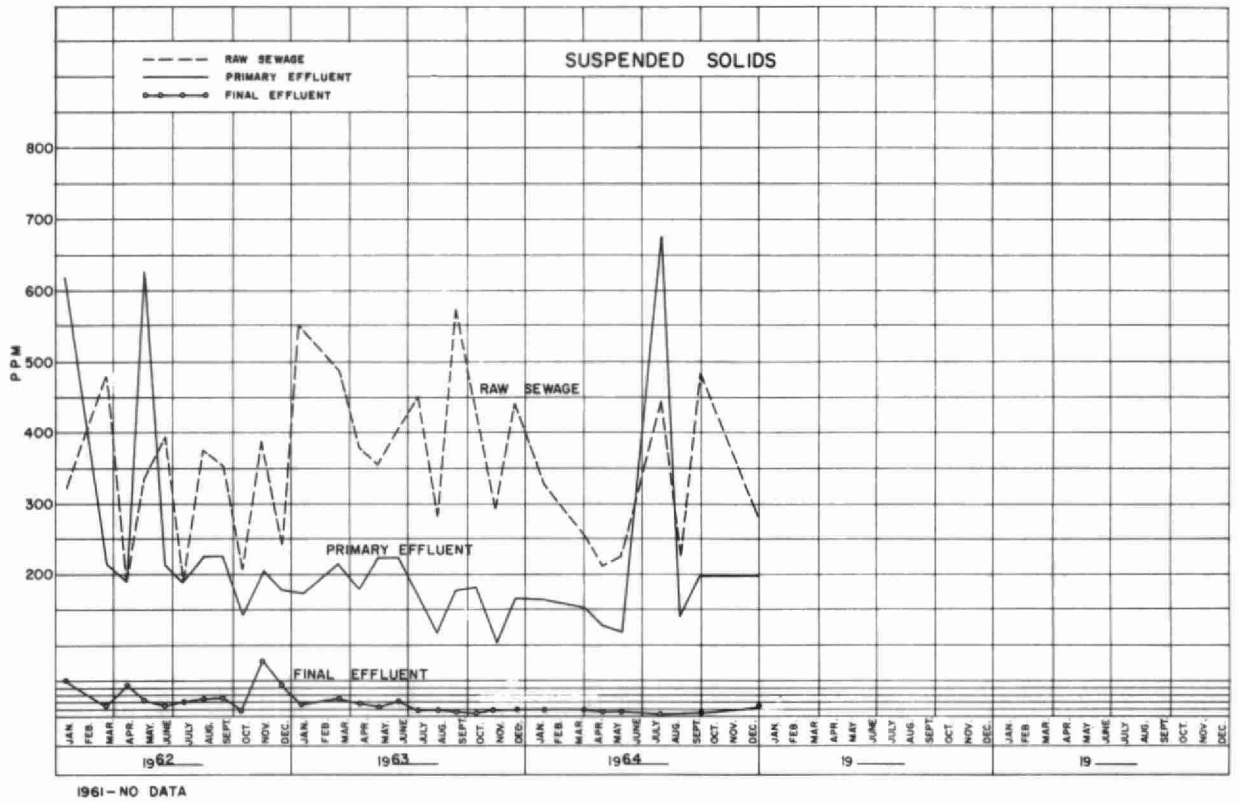
60
70
80
85
90
95
98
PERCENT EQUAL TO OR GREATER THAN



1961 – NO DATA

MONTHLY VARIATIONS



1961 – NO DATA

GRIT, B.O.D AND S.S. REMOVAL

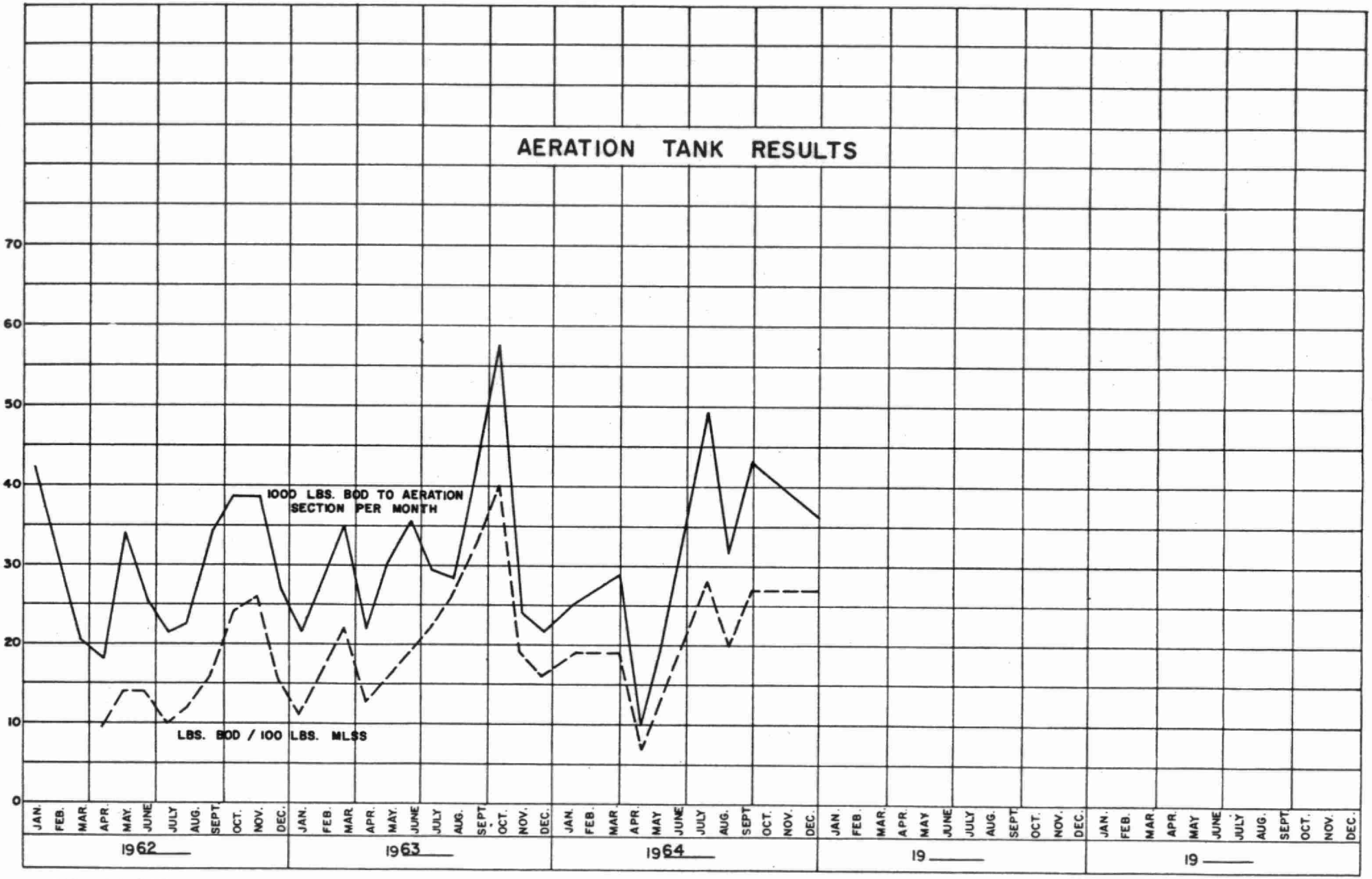
MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	300	10.3	96.5	22.3	328	10	97	24.5	37
FEB.	*318	5.8	98.0	22.3	311	8	97.5	21.6	13
MAR.	275	8.0	97.0	26.8	258	13	95.0	24.6	40
APR.	100	4.8	95.0	7.8	210	10	95.0	16.4	34
MAY	220	8.6	96.0	14.7	244	16	93.0	14.5	10
JUNE	*318	5.8	98.0	20.3	311	8	97.5	19.7	27
JULY	350	3.6	99.0	19.1	446	3	99.5	78.2	32
AUG.	320	1.8	99.5	23.8	224	3	98.5	16.5	43
SEPT.	660	3.6	99.5	44.4	484	4	99.0	32.5	26
OCT.	*318	5.8	98.0	20.2	311	8	97.5	19.6	33
NOV.	*318	5.8	98.0	19.5	311	8	97.5	18.9	31
DEC.	*318	5.8	98.0	22.4	311	8	97.5	21.8	29
TOTAL				269.0				261.0	355
AVG.	318	5.8	98.0	22.4	311	8	97.5	21.8	30

* Pro-rated (no data)

COMMENTS

An average loading of 318 ppm BOD and 311 ppm SS was observed in the raw sewage in 1964. The average BOD and SS in the effluent was 5.8 and 8 respectively, both being within OWRC requirements of 15 ppm for both BOD and SS.

The strength of raw sewage has decreased from 1964 since the local canning industries achieved better control on the quality of their effluents to the sanitary sewers. Grit removed during 1964 was 3.55 cu. ft. or approximately 2 cu. ft. per MG.


AERATION TANK RESULTS
1000 LBS. BOD TO AERATION SECTION PER MONTH
LBS. BOD / 100 LBS. MLSS
0
10
20
30
40
50
60
70
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT OCT. NOV. DEC.
1962
1963
1964
19
19

1961 – NO DATA

AERATION SECTION

MONTH	PRIM. EFFL B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. B.O.D. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	165	1675	19	1902
FEBRUARY		1790		
MARCH	145	1825	19	1652
APRIL	60	1813	7	4921
MAY	150	1858	14	2349
JUNE		1920		
JULY	450	1920	28	1038
AUGUST	215	1910	20	1698
SEPTEMBER	320	1904	27	1245
OCTOBER		1916		
NOVEMBER		1899		
DECEMBER		1869		
TOTAL				
AVERAGE	215	1858	19	2115

COMMENTS

Since the installation of a digester supernatant line to the aeration section both the aeration section and digester have operated satisfactorily.

DIGESTER OPERATION

Month	1000's cu. ft. to Digester	1000's cu. ft.	
		To Beds	Removed
January	16.95	-	-
February	14.78	-	-
March	15.62	0.65	0.16
April	13.82	-	1.77
May	14.11	0.11	0.57
June	16.04	6.57	0.62
July	17.10	0.80	2.14
August	16.21	0.50	2.30
September	17.52	0.73	2.93
October	17.97	1.43	5.36
November	17.80	1.78	14.84
December	20.92	-	8.99
Total	198.84	12.57	39.68
Average	16.57	1.05	3.31

COMMENTS

During 1964, 198,840 cu. ft. of sludge was pumped to the digester and 52,250 were removed. This represents a reduction in volume of 73%. This indicates economical operation.

CHLORINATION

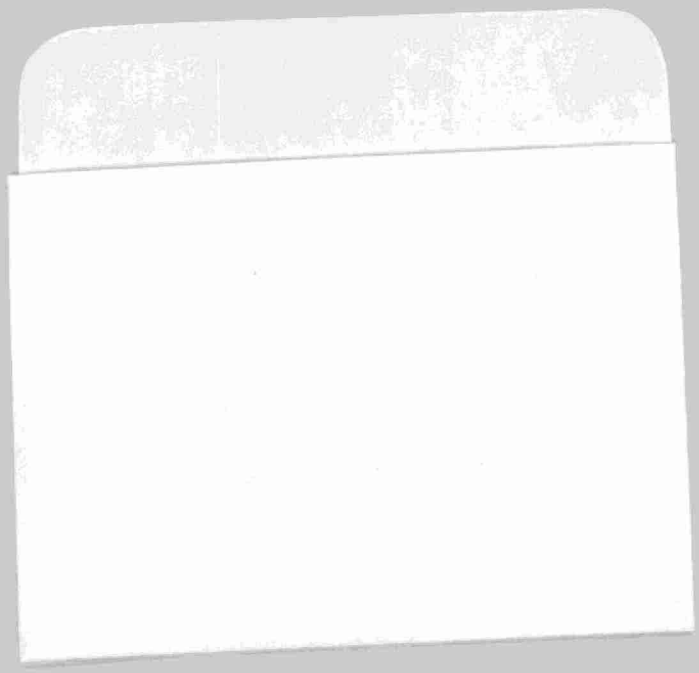
MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (P.P.M)
JANUARY	15.388		
FEBRUARY	14.267		
MARCH	20.068		
APRIL	16.359	* 119	2.18
MAY	13.896	** 183	5.11
JUNE	13.028	452	3.47
JULY	11.022	421	3.82
AUGUST	14.942	536	3.59
SEPTEMBER	13.543	473	3.49
OCTOBER	12.966	494	3.81
NOVEMBER	12.469	426	3.42
DECEMBER	14.354	* 106	2.29
TOTAL	172.302	3210	
AVERAGE	14.358	357	3.50

* Ten days chlorination
** Eight days chlorination

COMMENTS

Chlorination is required to lower the bacteria count of the effluent prior to its discharge to the Credit River.

During 1964 a total of 3210 pounds of chlorine were required during the period April 30 - December 3. This represents an average dosage of approximately 3.5 ppm.




ONTARIO WATER RESOURCES COMMISSION